# Factory tips on the M-Series Leicas

The M-series Leica is still the standard of excellence among rangefinder-type 35mm cameras. Yet despite Leica's popularity and length of time in service, there seems to be a long-felt vacuum of factory information in the repair field — at least, so it appears from the individual questions we've been answering at National Camera.

So instructor Monty Witt ventured forth to Leitz in hopes of obtaining some first-hand factory servicing tips. The notes he brought back from New Jersey should be of prime interest to CRAFTSMAN readers. And we'd like to express our gratitude to Leitz for their courtesy and assistance in gathering this material.

Although Monty also received bench training on the Leicaflex and the Leica M5, we'll confine ourselves this time to the notes he kept on the M2, M3, and M4 ( mainly because of the immediate availability of an M2 which was used for most of the illustrations). We plan to pass along the Leicaflex and M5 information in future CRAFTSMAN articles.

In addition to Monty's notes, we'll include some basic information on the M-series Leicas. If you're already a proficient Leica technician, please stick with us — you should find something new and useful besides what may already be familiar.

### Disassembly Steps For The M-Series Leicas

The Leica M2 illustrated in Fig. 1 is a slightly simplified version of the original M-series Leica, the M3. The M3 set the design precedents for the other M-series Leicas: the Ml (further simplified from the M2) and the MP (a special model for press photographers quite similar to the M2). More recently, the M4 (an improved version of the M3) took over the top roost. But all the Leica models mentioned are nearly identical from the technician's viewpoint. Only the M5, which we'll not discuss here, represents a radical departure from the original design.

If you've been in the repair business for any length of time, you can no doubt take a Leica apart. But we find that most technicians spend time removing parts that could just as well be left in place. So we'll outline the disassembly techniques to reach the adjustments and timing points of concern.

Starting with the top cover plate disassembly, remove the screw at the top of the lens mounting ring, Fig. 1. This screw is normally sealed with a black locking agent. Since the screw must be removed to pull either the top cover plate or the body shell, you can frequently tell from the condition of the locking agent whether or not the camera has previously been disassembled.

Next, remove the camera's base plate as you would for loading film. The Leicas based on the M3 design carry over the load-from-the-bottom technique of the screw-mount Leicas. But the M-series Leicas added a hinged back to facilitate loading. You can remove the hinged back by pushing the release pin from left to right in Fig. 2.

Reaching into the supply-spool cavity, wedge the rewind fork to prevent it from turning. Then, use a Multispan wrench to unscrew the cover screw that holds the rewind knob, Fig. 3. An exception here is the M4—the rewind knob in the M4 sits at a convenient cant and is held by a setscrew.

Probably one of the main disassembly problems faced by the technician is the removal of the wind lever cover screw, Fig. 3. The wind lever cover screw has a right-hand thread, but it may be extremely tight. To avoid scarring the polished

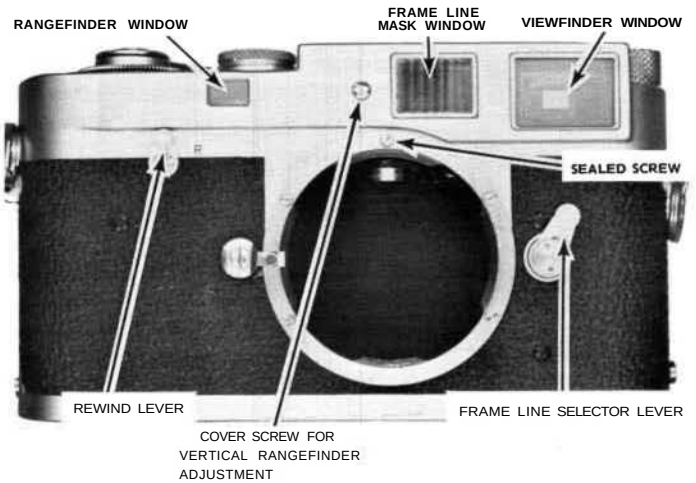



*Figure1*

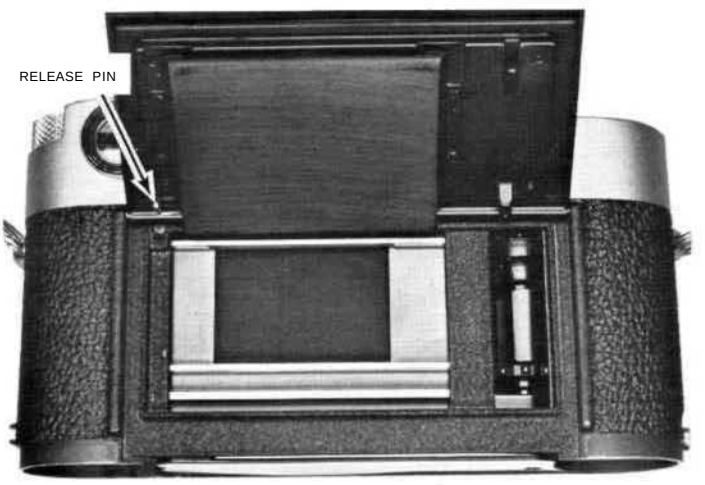



*Figure2*

surface, use a Flexiclamp wrench or a split collet to unscrew the wind lever cover screw. You can then lift off the wind lever and, in the M2, the counter dial.

Also, if you're working on the M2, remove the cover plate retaining screw shown in Fig. 3. You won't find this retaining screw in the M3 or the M4 — instead, unscrew the retaining ring accessible after removing the wind lever. The reason for the difference is that the AA2 has an external, manually set counter dial. But in the M3 and AA4, the counter dial is underneath the top cover plate. The spring-loaded counter dial in the M3 and AA4 automatically returns when you pull out the film take-up spool.

Another tricky part to remove is the retaining ring around the rewind shaft. The problem here is that standard tools can't do the job — there isn't enough room for a Flexiclamp wrench and there are no notches for a Multispan wrench. So here's one place that you may wish to design a special, tubular tool that fits over the retaining ring.

The remaining top cover plate components are no problem. Take out the speed knob retaining screw, Fig. 3, and lift off the speed knob. And remove the four screws holding the accessory shoe, also shown in Fig. 3. Lift off the accessory shoe, the accessory shoe pressure plate, and the spring.

Proceeding to the back of the camera, unscrew the two flash socket cover rings and the two flash socket bushings. If you're working on the M3, also unscrew the eyepiece frame. Now, lift off the top cover plate.

Before we go into the adjustments and timing points now visible, we'll complete the disassembly of the body shell and the rangefinder, Fig. 4. You may, however, wish to replace the wind lever with its cover screw to examine the operation at the top of the camera. Then, turn over the camera and remove the three screws holding the bottom cover plate, Fig. 5. Lift off the bottom cover plate and the base lock plate.

## Adjustments At The Bottom Of The M-Series Leica

Several adjustment points are now visible at the bottom of the camera, Fig. 6. Notice that the M-series Leicas departed from the conventional methods of locking the curtain take-up rollers. To adjust the curtain tensions,

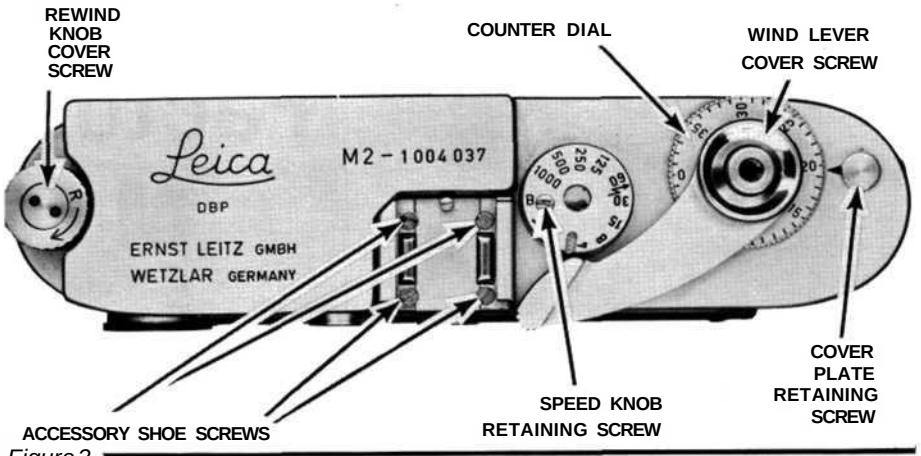
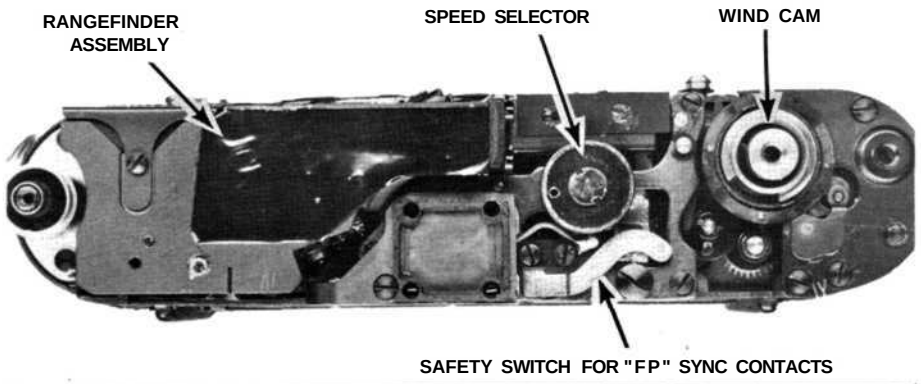


*Figure 3*



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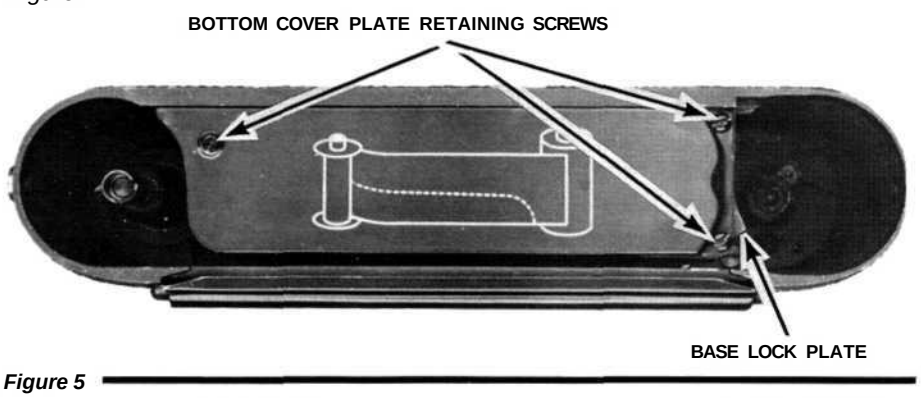

***Figure 5***

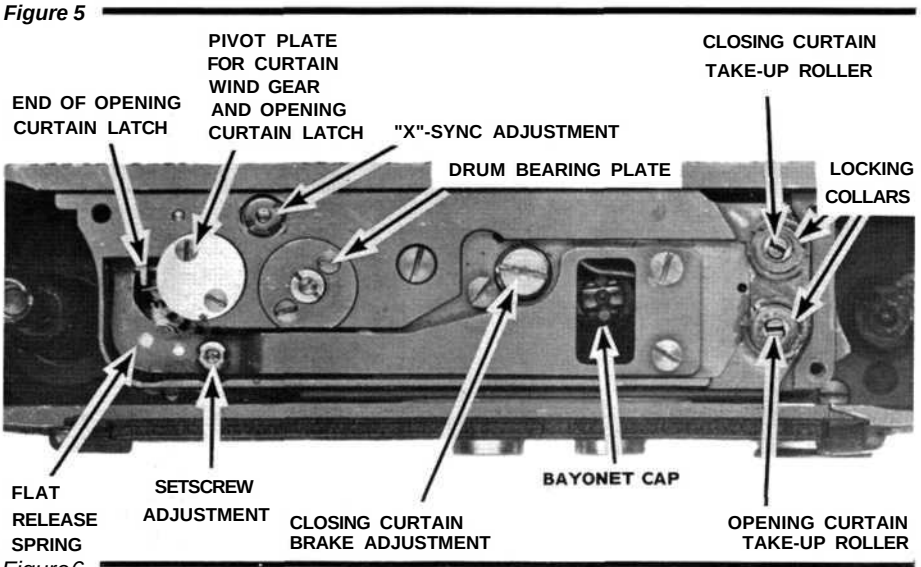

*Figure 6*

use a screwdriver with a blade slightly wider than the slotted ends of the take-up rollers central shafts. Insert the screwdriver into the slotted end of one central shaft and push down — that depresses the locking collar and frees the central shaft. You can now turn the screwdriver to add or let off tension.

Another departure from tradition is the elimination of the interlocking-stud arrangement common to the drum-type focal-plane shutters. In the shutter-cocked position, a slot in the curtain wind gear clears the drum gear at the bottom of the curtain drum. Then, the opening curtain latch, Fig. 6, drops into engagement with the opening curtain cam underneath the drum gear.

Depressing the release button pushes the end of the flat release spring against the opening curtain latch. So the opening curtain latch, pushed out of engagement with the opening curtain cam, frees the opening curtain. Simultaneously, the flat release spring allows the closing curtain latch, Fig. 7, to drop down and engage the closing curtain cam.

meeting these specifications is the setscrew on the flat release spring, Fig. 6.

The "X"-sync adjustment is another conveniently located adjustment point visible in Fig. 6. The collar with the Multispan notches controls an eccentrically positioned stud at the other side of the bottom plate. And the stud, in turn, controls the position of the fixed "X" contact. Turning the collar corrects the "X"-sync delay by setting the proper space gap between the two contacts.

A second eccentric controls the tension of the closing curtain brake spring, Fig. 6. The brake spring, which we'll see after removing the body shell, engages a cam operated by the closing curtain drum. And by turning the eccentric from the bottom of the camera, you can control the amount of braking action.

Check the proper tension for the closing curtain brake by first setting the shutter to "bulb." Then, cock and release the shutter. The closing curtain should be stopped by the brake spring before reaching the extreme limit of its travel. So try pulling the closing curtain in the direction of its release movement — you should be able to pull the curtain an additional 0.1mm—0.5mm.

In some cameras, there's also an eccentric adjustment for the opening curtain brake; the opening curtain brake eccentric is shown from a Leica M3 in Fig. 8. Check the adjustment of the opening curtain brake by holding the shutter open at the "bulb" setting. Now, looking from the front of the focal-plane aperture, examine the position of the opening curtain bar at the right-hand side of the camera. If the opening curtain brake is properly adjusted, the edge of the opening curtain bar should be 1.5mm — 2.5mm beyond the edge of the focal-plane aperture.

Before moving too far away from Fig. 6, we should point out the bayonet cap in the focal-plane light shield. You can remove the bayonet cap after rotating it a partial turn. As you will see a little later, removing the bayonet cap uncovers an access hole in the focal-plane light shield — a hole which makes it easier to reach one of the rangefinder retaining screws.

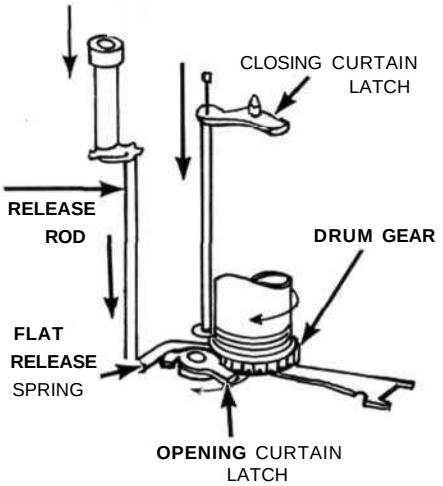


*Figure 7*

Leica's specifications here are that the opening curtain should release when you depress the release button approximately 1.5mm. Once you let up on the release button, the flat release spring raises the closing curtain latch above the closing curtain cam. Checking the operation at "bulb," the release button should have an additional 0.2mm upward travel after the closing curtain has released. The adjustment point for

LEICA M3 OPENING CURTAIN BRAKE ADJUSTMENT

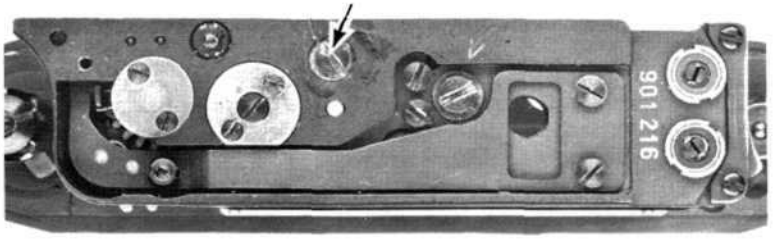


*Figure 8*

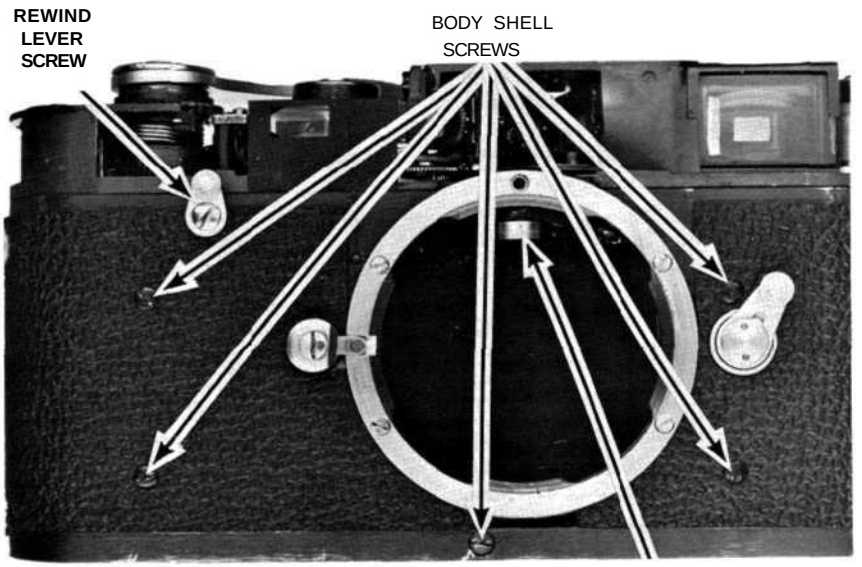


*Figure 9*

### Removing The Body Shell

The next step is to separate the body shell from the shutter mechanism. First, take out the rewind lever by removing its retaining screw, Fig. 9. Then, remove the five screws holding the body shell, also pointed out in Fig. 9. You may find it necessary to remove the frame line selector lever to reach the upper body-shell screw at the right of the lens mounting ring.

The AA2 we used for the illustrations does not have a self timer. But if you've worked on M-series Leicas before, you probably know that the cocking lever in models with a self timer has a left-hand thread. What you may not have known is that you don't have to remove the self-timer cocking lever to pull the body shell — just cock the self timer prior to separating the body shell from the shutter mechanism.

Some manipulation — but no pressure — is now required to remove the body shell. As you pull off the body shell, push in the rangefinder control arm (against its tension) for clearance.

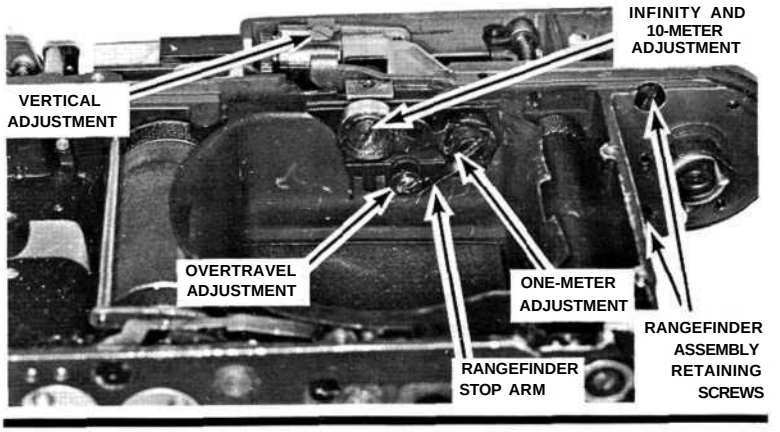


*Figure10*

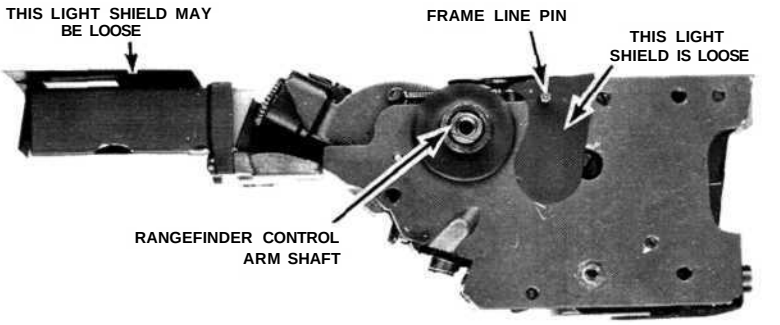


*Figure 17*

### Rangefinder Adjustment Points and Disassembly Procedure

We can now more easily point out the rangefinder adjustments. Besides the normal horizontal (infinity) and vertical adjustments, there are adjustments for the linearity at different distances and for the overtravel of the rangefinder control arm.

Make your infinity and 10-meter rangefinder adjustments by turning the eccentric shaft on the rangefinder control arm roller, Fig. 10. If the rangefinder aligns properly at infinity and 10 meters, check the alignment of the superimposed images with a target placed one meter from the focal plane.

The adjustment point for the one-meter target is the eccentric at the other end of the rangefinder control arm, Fig. 10. To turn the one-meter eccentric, first loosen the rangefinder control arm retaining screw. You may have to alternate between the two eccentrics, checking and adjusting at the designated distances, to correct the linearity for all distance settings.

In Fig. 10, the rangefinder control arm has moved (via spring tension) as far as it can go toward the front of the camera. Here, the rangefinder stop arm comes against another eccentric. This eccentric is the overtravel adjustment for the rangefinder control arm. In other words, at the infinity setting the lens pushes the rangefinder control arm toward the back of the camera. But the rangefinder control arm should not touch the eccentric at infinity — you should be able to push the rangefinder control arm a slight distance beyond infinity before it is stopped by the eccentric.

The vertical rangefinder adjustment, also shown in Fig. 10, is still accessible after replacing the top cover plate; just removing the screw shown in Fig. 1 provides access to the vertical adjustment point. So you can make all rangefinder adjustments with the camera assembled — the distance adjustments are accessible through the lens opening, and the vertical adjustment is accessible through the clearance hole in the top cover plate.

Removing the rangefinder assembly disturbs the setting of the one-meter eccentric and could disturb the overtravel eccentric. But you can scribe the positions of the eccentrics prior to disassembly. On reassembly, aligning the scribe marks saves a lot of time in the adjusting department.

Now, remove the two rangefinder assembly retaining screws shown in Fig. 10. And, after scribing the one-meter eccentric's position, remove the rangefinder control arm screw. Take out the one-meter eccentric, the rangefinder control arm, and the rangefinder stop arm.

There's one more screw holding the rangefinder assembly — the long screw which passes through the overtravel eccentric. But you may find that this screw is a little difficult to reach. So we've finally come to the purpose behind removing the bayonet cap in the focal-plane light shield. Insert a long screwdriver through the light shield access hole and unscrew the overtravel eccentric retaining screw.

Next, carefully lift off the rangefinder assembly; as you can see in Fig. 11, there's a loose light shield at the bottom of the rangefinder. If you do encounter a damaged rangefinder, you'll usually have to replace the complete assembly shown in Fig. 11 — individual rangefinder replacement parts are not available.

Although you may have reversed the sequence in the past, it's easier to remove the focal-plane light shield after taking out the rangefinder assembly. So remove the three

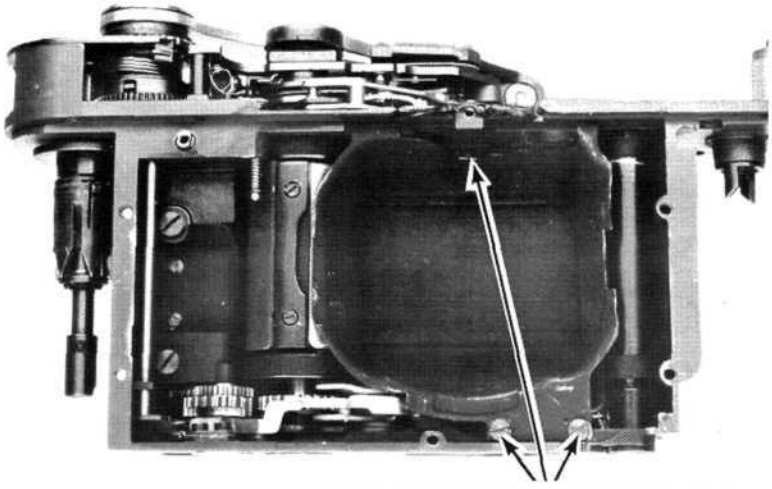


*Figure 12*

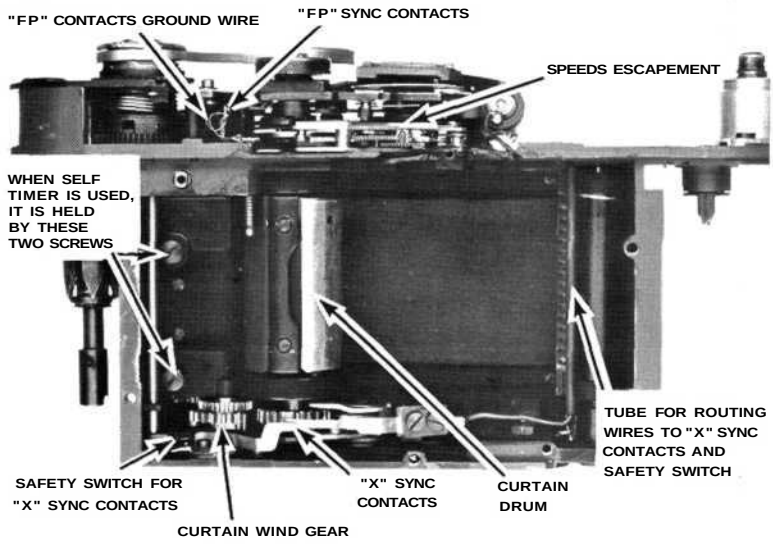
"FP" CONTACTS GROUND WIRE
"FP" SYNC CONTACTS
SPEEDS ESCAPEMENT
WHEN SELF TIMER IS USED, IT IS HELD BY THESE TWO SCREWS
TUBE FOR ROUTING WIRES TO "X" SYNC CONTACTS AND SAFETY SWITCH
SAFETY SWITCH FOR "X" SYNC CONTACTS
"X" SYNC CONTACTS
CURTAIN DRUM
CURTAIN WIND GEAR

*Figure13*

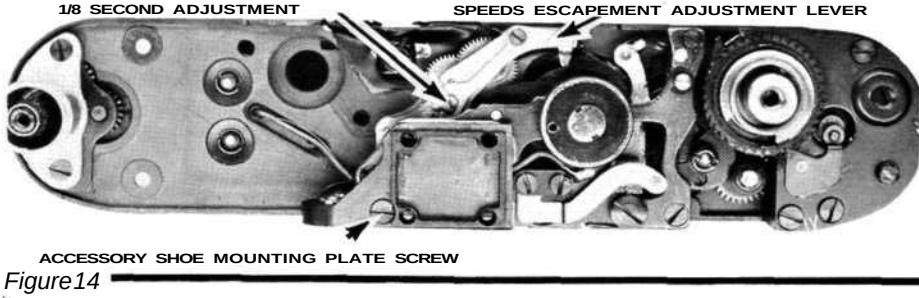


*Figure14*

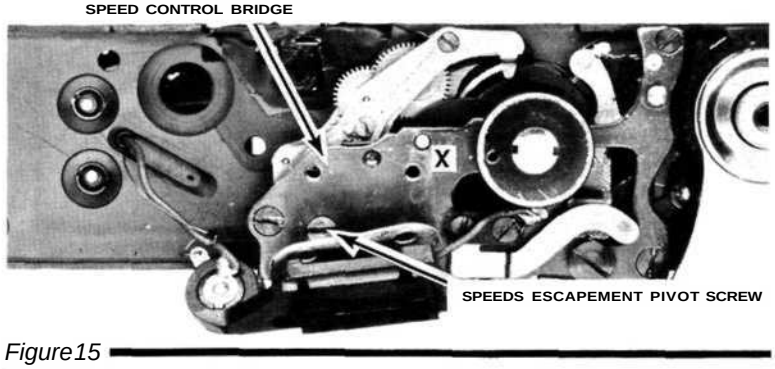


*Figure15*

screws shown in Fig. 12 and lift out the focal-plane light shield.

### Removing And Replacing The Speeds Escapement

The present stage of disassembly may be as far as you'll normally go for routine cleaning and lubrication. But there is one more recommended step — the removal of the speeds escapement at the top of the camera. Fig. 13.

If this is your first encounter with an M-series Leica, the speeds escapement seems quite unique. Varying amounts of retard engagement are obtained by swinging the entire escapement around a pivot point. The speeds escapement adjustment lever, Fig. 14, rides against the slow-speed cam, one of the cams moved by the speed selector.

The eccentric pointed out in Fig. 14 is your adjustment point for the slow speeds. After making the high-speed adjustments (which we'll discuss a little later), turn the adjustment arm eccentric to correct the exposure at the 1/8 second setting.

To remove the speeds escapement, first take out the screw holding the accessory shoe mounting plate, Fig. 14. Now, lift aside the accessory shoe mounting plate to expose the speeds escapement pivot screw, Fig. 15.

Looking under the speed control bridge, Fig. 15, locate the speeds escapement pivot spring. The long (upper) end of the spring hooks to a post on the underside of the speed control bridge, and the short end hooks to a stud on the speeds escapement.

Disconnect the long end of the pivot spring from the hooking post. Then, remove the pivot screw, Fig. 15, and slide out the speeds escapement toward the front of the camera.

As you've no doubt noticed, the pivot screw is sealed — in this case, the locking agent is used to hold the pivot screw adjustment for the proper freedom of the speeds escapement. So let's take a moment to discuss the reassembly of the speeds escapement and the pivot screw adjustment procedure.

First, set the speed selector to 1 second and push the pallet cam follower toward the front of the camera, Fig. 16. Place the pivot spring on top of the speeds escapement and slide the escapement into place —make sure that the pallet control lever (on top of the speeds

escapement) is hooked behind the pallet cam follower. Replace the pivot screw and hook the pivot spring.

Now, to adjust the pivot screw, hold the speeds escapement against its spring tension — away from the speed control cam stack. Tighten the pivot screw until the speeds escapement cannot move toward the speed control cam stack under its own tension. Then, back off the pivot screw until the speeds escapement does swing into contact with the speed control cam stack.

Test your adjustment by pushing down on the speed control bridge at the point marked "X" in Fig. 15. The speeds escapement should still move freely while you're exerting pressure. If it doesn't, slightly back off the pivot screw. Finally, reseal the pivot screw to hold your adjustment.

### Slit-Width Adjustments

Since we mentioned the slow-speed adjustment, let's look at the slit-width adjustment at the back of the camera. The slit-width adjustment is the eccentric post on the closing curtain latch, Fig. 17.

Say that you've just released the shutter at one of the slit-width speeds. You know that the opening curtain starts across the aperture, but the closing curtain is held back by the closing curtain latch. It's up to the opening curtain to disengage the closing curtain latch at the proper time for the desired slit width.

The part that disengages the closing curtain latch is the disengaging lever, Fig. 17. And the disengaging lever is controlled by the release cam, a cam that spins with the opening curtain drum. So, once the opening curtain has traveled a sufficient distance, the release cam strikes the disengaging lever. The disengaging lever, in turn, strikes the eccentric post on the closing curtain latch and frees the closing curtain.

Turning the speed selector to the different shutter speeds positions the disengaging lever — that's how the speed selector changes the release point of the closing curtain for different shutter speeds. From the **front** of the camera, Fig. 16, you can see the end of the disengaging lever that rides against the high-speed cam.

The eccentric post on the closing curtain latch is the adjustment point for all the slit-width speeds. Turning the eccentric post to correct 1/500 second and 1/250 second should bring

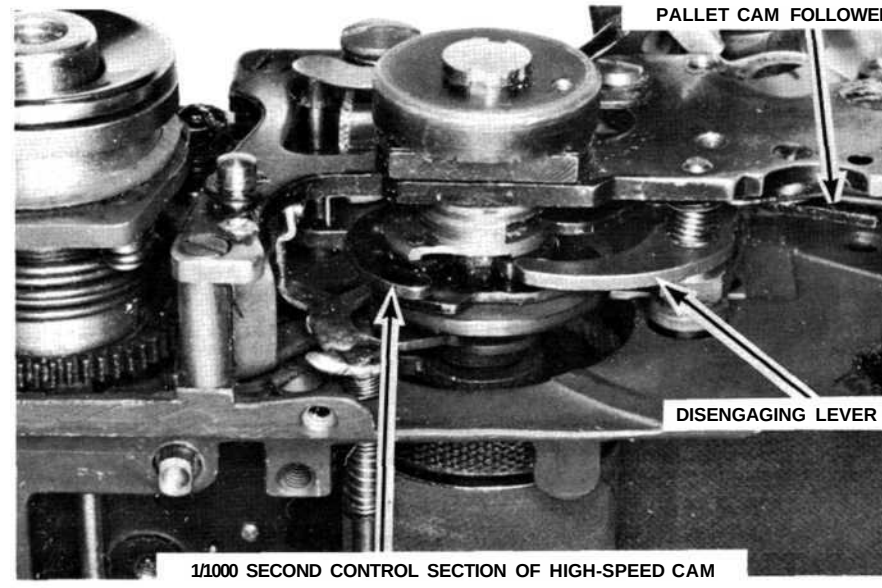


*Figure16*

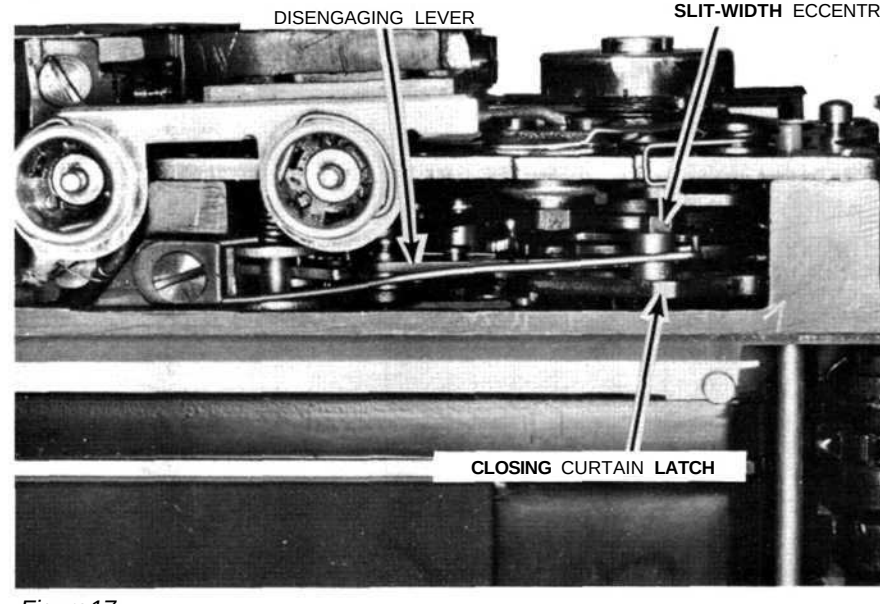


*Figure17*

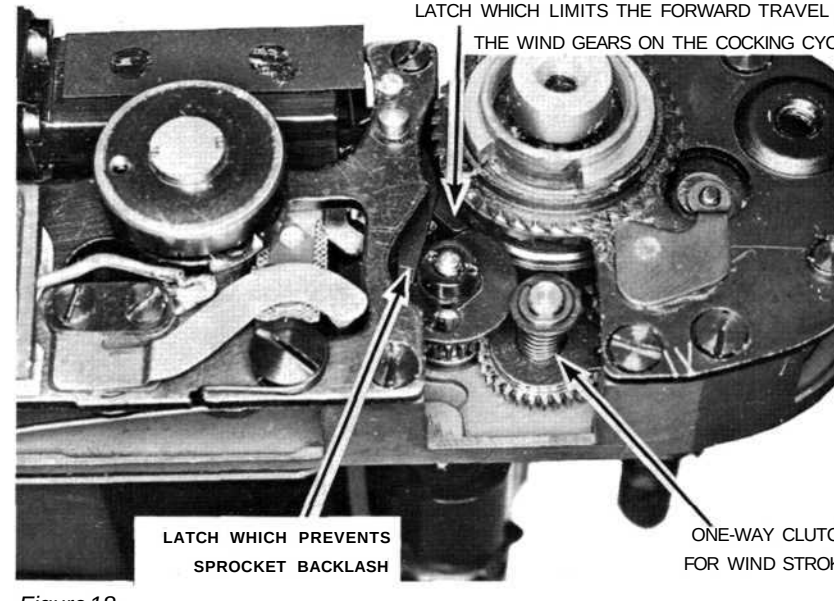
LATCH WHICH LIMITS THE FORWARD TRAVEL OF
THE WIND GEARS ON THE COCKING CYCLE
LATCH WHICH PREVENTS
SPROCKET BACKLASH
ONE-WAY CLUTCH
FOR WIND STROKE

*Figure18*

in the remaining speeds as well. But if the 1/1000 second is still out of tolerance, you have a slotted adjustment on the high-speed cam, Fig. 16; reforming this section of the high-speed cam affects only the 1/1000-second setting. In fact, in the newer versions of the M-series Leicas, the high-speed cam is slotted at most of the individual speeds to allow precise adjustments throughout the speed range. The slow-speed cam, which controls the speeds escapement, also has slotted adjustment points for individual speeds.

### Other Tests And Adjustments In The M-Series Leicas

Although we've disassembled the Leica as far as would normally be necessary, we'll mention some of the points to check in the event you go further. For one, check the action of the three wind latches: the latches shown in Figs. 18 and 19 must all drop into engagement simultaneously at the end of the wind stroke.

Another timing point is shown in Fig. 20. The curtain wind gear engages the drum gear to advance the curtains. If you'll cock the shutter — and hold the wind lever fully advanced — the first tooth in the curtain wind gear (clockwise of the slot in the gear, as seen from the top) should center on the opening curtain latch. You can remove the curtain wind gear by taking out the pivot plate from the bottom of the camera, Fig. 6. So on reassembly, you must time the curtain wind gear to meet the condition just described.

The plentiful adjustment points are true testimony to Leica quality. For example, how many focal-plane shutters allow you to adjust individual shutter speeds within a range? Another convincing example is the alignment adjustment for the curtains. In most focal-plane shutters, you straighten a leaning curtain by shimming the tapes. But most of the M-series Leicas provide eccentric bushings for the upper ends of the take-up rollers, Fig. 21. Correcting the squareness of the curtain bars is just a matter of turning the eccentric bushings.

Perhaps the word of today is "SLR," but many a connoisseur still demands the comparative quiet and convenience of the M-series Leica. So we hope this article has been of some help in giving the regal Leica the quality field service it deserves.

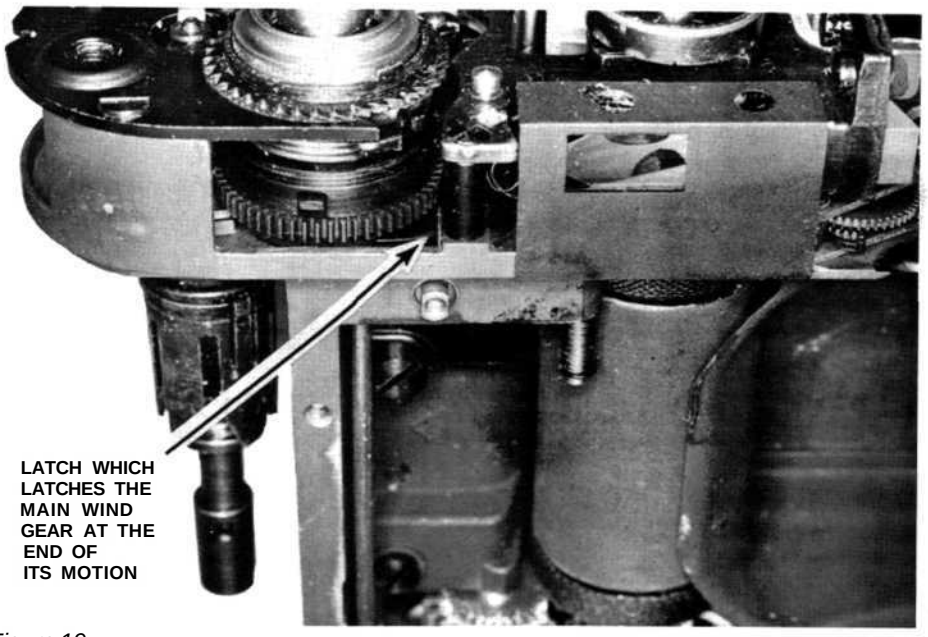


*Figure 19*

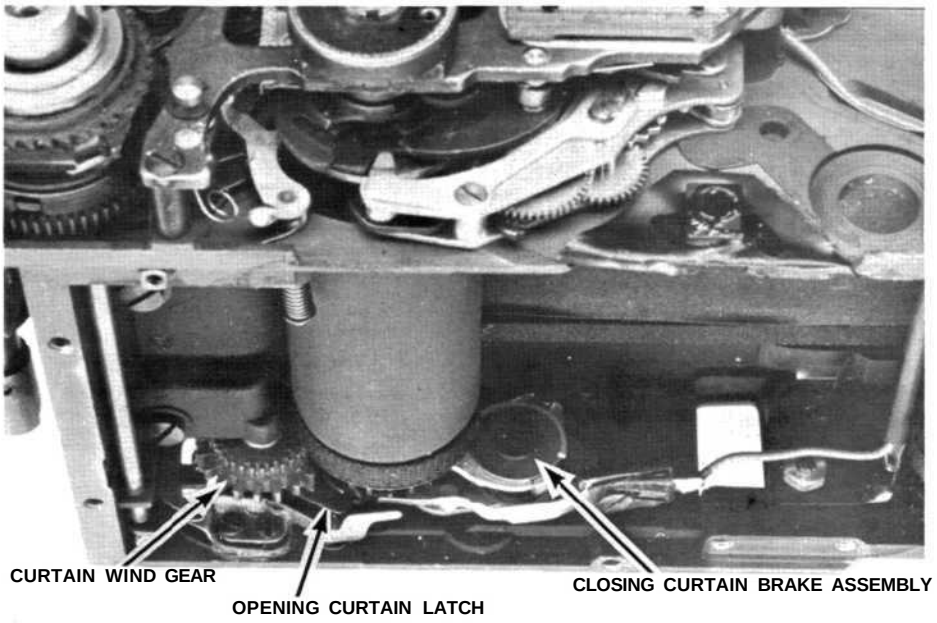


*Figure 20*

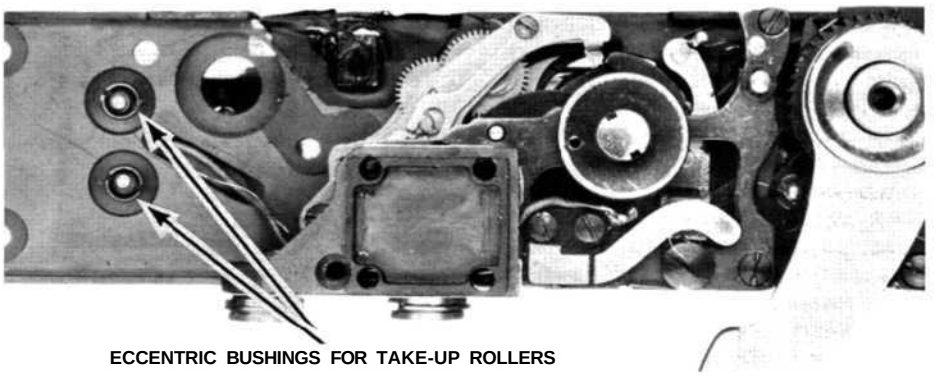


*Figure 21*